

SUBSTITUTE AMENDMENT UNDER 37 C.F.R. § 1.116
Application No.: 10/658,372

Attorney Docket No.: Q77434

AMENDMENTS TO THE SPECIFICATION

Please replace the present title with the following amended title:

METHOD OF PRODUCING A REFLECTION ~~TYPE~~ MASK BLANK, METHOD OF PRODUCING A REFLECTION ~~TYPE~~ MASK, AND METHOD OF PRODUCING A SEMICONDUCTOR DEVICE

First full paragraph on page 3, please substitute the following paragraph:

In the EUV lithography, the light in a specific narrow wavelength band is used so that the influence of wavelength shift is great. The shift in peak wavelength of the reflectance causes mismatching with a mirror of the exposure apparatus used upon pattern transfer. Therefore, the peak wavelength must accurately be controlled. Furthermore, the shift in peak wavelength causes ~~the~~ a decrease in reflectance of the multilayer reflection film. Thus, the change with time in stress of the multilayer reflection film poses various problems in practical use of the mask, for example, causing a change in flatness of a substrate.

Fourth full paragraph on page 3, please substitute the following paragraph:

With respect to the above-mentioned object, the present inventor earnestly studied the problems and sought their solutions. As a result, it has been found out that, by heat-treating a multilayer reflection film formed on a substrate, the change with time in stress of the multilayer reflection film can be suppressed without causing ~~the~~ a decrease in reflectance of the multilayer reflection film.

Fourth full paragraph on page 5, please substitute the following paragraph:

As the multilayer reflection film, use is made of, for example, a multilayer film obtained by alternately laminating molybdenum thin films and silicon thin films. ~~The~~ This multilayer reflection film ~~of the type~~ has a high reflectance for the EUV light of 13-14 nm and a high compressive stress. By carrying out the heat treatment of this invention, the change with time in stress of the film can be suppressed.

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Fifth full paragraph on page 5, please substitute the following paragraph:

By forming a pattern ~~on~~ in the absorber layer of the reflection type mask blank produced by the above-mentioned method of this invention, a reflection type mask can be obtained. According to this invention, it is possible to provide a reflection type mask which is suppressed in change with time in stress of the multilayer reflection film and which can stably be used in practical use.

Paragraph bridging pages 6 and 7, please substitute the following paragraph:

A reflection type mask blank produced by the method of this invention comprises a multilayer reflection film formed on a substrate for reflecting EUV light as exposure light and an absorber layer formed on the multilayer reflection film for absorbing the EUV light as the exposure light. In necessary, a buffer layer which is resistant against an etching environment upon formation of a pattern on the absorber layer and thus serves to protect the multilayer reflection film may be provided between the multilayer reflection film and the absorber layer. A reflection type mask produced in the method of this invention is obtained by forming the pattern ~~on~~ in the absorber layer of the reflection type mask blank.

Sixth full paragraph on page 14, please substitute the following paragraph:

Formation of the pattern ~~on~~ in the absorber layer is carried out in the following manner. By applying a resist for electron beam writing on the above-mentioned reflection type mask blank and baking the resist, a resist layer is formed. By electron beam writing and development, a resist pattern is formed. Then, using the resist pattern as a mask, the absorber layer is etched by a method such as dry etching. In case where the absorber layer is made of a material containing Ta as a main metal component, the pattern can be formed by dry etching using chlorine with the buffer layer serving as a protection layer for the multilayer reflection film. After the pattern of the absorber layer is formed, the resist layer left on the pattern of the absorber layer is removed. If necessary, the buffer layer is removed in a patterned shape in accordance with the pattern of the absorber layer. For example, in case where a film containing Cr as a main component is used as the buffer layer, the buffer layer can be removed by dry etching using a mixed gas of chlorine and oxygen.

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First full paragraph on page 24, please substitute the following paragraph:

By the use of a multilayer film obtained by alternately laminating, for example, molybdenum thin films and silicon thin films ~~as the~~ to form a multilayer reflection film, a high reflectance for the EUV light of 13-14nm is achieved. By carrying out the heat treatment ~~in~~ according to this invention, it is possible to suppress the change with time of the multilayer reflection film.